



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,461	09/29/2003	Ping Hsu	HSUP3012/EM	1507
23364	7590	07/27/2005	EXAMINER	
BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314			LINDSAY JR, WALTER LEE	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 07/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/671,461	HSU ET AL.	
	Examiner	Art Unit	
	Walter L. Lindsay, Jr.	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

This Office Action is in response to an Amendment filed on 5/12/2005.

Currently, claims 1-6 are pending.

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.
2. The amendment filed 5/12/2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: a first conductive layer and second conductive layer.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

Art Unit: 2812

2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
5. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being obvious over the Applicant's Admitted Prior Art (AAPA) filed on 9/29/2003 in view of Gluschenkov et al. (U.S. Patent No. 6,838,334 filed 1/4/2005).

The AAPA shows the method substantially as claimed in Figs. 1A-1E and corresponding text as: providing a substrate (10) (page 1, line 11); forming a deep trench in said substrate (page 1, lines 10-11); forming a dielectric layer (12) in said deep trench, said dielectric layer covering the sidewall and bottom of the deep trench (page 1, lines 12-13); filling the deep trench with a first conductive layer (13) (page 1, lines 13-16); removing a portion of said dielectric layer not covered by said first conductive layer (page 1, lines 16-18); refilling the deep trench with another dielectric layer (14), said another dielectric layer covering a portion of the sidewall of the deep trench not covered by said first conductive layer (page 1, lines 19-22); forming a collar oxide layer (16) in the deep trench (page 1, lines 23-29); filling the deep trench with a second conductive layer (17) (page 1, lines 23-29); removing a portion of said collar oxide layer not covered by said second conductive layer (page 1, lines 30-32); and filling the deep trench with a third conductive layer (18) (page 1, line 33- page 2, line 1) (claim 1).

The AAPA lacks the anticipation of explicitly teaching that: 1) partially removing said another dielectric layer, while leaving at least a portion thereof filled in a gap between the sidewall of the deep trench and the first conductive layer; and forming a collar oxide layer in the deep trench, said collar oxide layer covering a portion of the

Art Unit: 2812

sidewall of the deep trench not covered by the dielectric layers (claim 1); 2) the material of said dielectric layer is the same as that of said another dielectric layer (claim 2); 3) the material of said dielectric layer and said another dielectric layer is nitride (claim 3); 4) the material of said dielectric layer and said another dielectric layer is silicon nitride (claim 4); 5) the another dielectric layer is a nitride layer (claim 5); and 6) the material of said another dielectric layer is silicon nitride (claim 6).

Gluschenkov teaches the fabrication of a collar region in a similar deep trench formation process. Dielectric layer (125) is formed inside the trench region (col. 2, lines 16-34). A bottom dielectric layer (135) is also formed it is comprised of Si_3N_4 (col. 2, lines 35-67). The dielectric layer (125) is comprised of about 30 Å to 200 Å of Si_3N_4 (col. 2, lines 35-67). The trench is filled with polysilicon and an upper portion of dielectric layer (125) is removed from the trench. This process helps to overcome the problems found as dimensions shrink, to reduce the amount of space taken up by the collar and to suppress vertical parasitic leakage.

It would be obvious to one of ordinary skill in the art at the time the invention was made to modify the method as given by the AAPA by removing unnecessary portion of said another dielectric layer, forming a collar oxide covering the portion of the sidewall not covered by the dielectric and forming both dielectrics out of silicon nitride, as taught by Gluschenkov, with the motivation that the Gluschenkov teaches that the problem of dimensions shrinking can be handled by the reduction of the amount of space the collar occupies and to suppress vertical parasitic leakage.

Response to Arguments

6. Applicant's arguments filed on 9/29/2003 in Application 10/671461 have been fully considered but they are not persuasive. The Applicant states that the AAPA does not teach the refilling of the deep trench not covered by the first polysilicon. The examiner notes that the thermal oxidation of AAPA teaches that a dielectric is used to refill the area of the trench. The Applicant states that his thermal layer 14 does not fill the gap portion left between the first polymer (conductive layer) and the sidewall of the deep trench. The examiner would like to point out that the claimed invention only calls for the refilling dielectric to cover portions of the sidewall not covered by the first polymer, this being the case the applicant's AAPA meets this criteria.

7. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the Applicant states that '334 does not teach "refill a gap" in any sense. The examiner would like to point out the claimed invention teaches refilling (which can be done by thermal oxidation), with a dielectric layer above a first polymer (conductive layer) not the refilling of a gap. The examiner would like to note that both '334 and AAPA deal with collar formation '334 does so by etching a dielectric layer so that it only fills the space

Art Unit: 2812

between the conductive layer and the trench sidewall. This being the case, the examiner would also like to point out that, nowhere in the claimed invention is the gap defined to be "above the first dielectric and below the upper surface of the first polymer (conductive layer)".

8. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

By Applicant citing the AAPA, the applicant has agreed that this information is knowledge that was made available before the present invention was made.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

Art Unit: 2812

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter L. Lindsay, Jr. whose telephone number is (571) 272-1674. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Walter L. Lindsay, Jr.
Examiner
Art Unit 2812

WLL


July 20, 2005